What is claimed is:

1. A track analyzer included on a vehicle traveling on a track, the track analyzer comprising:

a track detector for determining track parameters comprising at least one parameter of a group including a grade of the track, a superelevation of the track, a gauge of the track, and a curvature of the track; and

a computing device, communicating with the track detector, for determining in real-time if the track parameters are within acceptable tolerances, and, if any one of the track parameters are not within acceptable tolerances, generating corrective measures.

2. The track analyzer set forth in claim 1, the track detector further comprising:

a vertical gyroscope for determining the grade of the track and the superelevation of the track;

a gauge determiner for determining the gauge of the track; and

a rate gyroscope for determining the curvature of the track.

3. The track analyzer set forth in claim 2, the vertical gyroscope comprising a vertical gyroscope selected from the group including a mechanical vertical gyroscope and a solid state vertical gyroscope.

4. The track analyzer set forth in claim 3, the mechanical vertical gyroscope including:

an inner gimbal;

an outer gimbal; and

a spin motor creating an inertial force, the grade and the elevation of the track being determined by motions of the inner and outer gimbals against the inertial force.

5. The track analyzer set forth in claim 3, the solid state vertical gyroscope including:

a grade determiner for determining the grade of the track; and

a superelevation determiner for determining the superelevation of the track.

6. The track analyzer set forth in claim 2, the rate gyroscope comprising a rate gyroscope selected from the group including a mechanical rate gyroscope and a solid state rate gyroscope.

7. The track analyzer set forth in claim 1 wherein the computing device determines a plurality of calculated parameters as a function of the track parameters, determines in real-time if the calculated parameters are within acceptable tolerances, and, if the any one of the calculated parameters are not within acceptable tolerances, generates corrective measures.

8. The track analyzer set forth in claim 7 wherein the computing device generates corrective measures in real-time.

9. The track analyzer set forth in claim 1, further comprising:

a temperature determiner for determining a temperature associated with the track detector.

10. The track analyzer set forth in claim 1, further comprising:

an accelerometer assembly for determining a set of orthogonal accelerations associated with the vehicle.

11. The track analyzer set forth in claim 1, further including:

a video display device communicating with the computing device, the corrective measures including messages displayed on the video display device for use by the vehicle operator.

12. The track analyzer set forth in claim 1, further including:

an analog-to-digital converter for converting analog signals from the track detector into respective digital signals which are transmitted to the computing device.

13. The track analyzer set forth in claim 1, further including:

a communications device in communication with the computing device for communicating the corrective measures and associated track parameters to a locomotive control computer associated with the vehicle.

14. The track analyzer set forth in claim 13 wherein the communications device also communicates the corrective measures to at least one of a truck lubrication system and a truck steering mechanism.

15. The track analyzer set forth in claim 1, further including:

a look-up table, communicating with the computing device, for storing the acceptable tolerances.

16. The track analyzer set forth in claim 14 wherein:

the acceptable tolerances identify urgent defects and priority defects;

the corrective measures include actions to be implemented substantially immediately for urgent defects; and

the corrective measures include actions to be implemented within a predetermined response window for priority defects.

17. The track analyzer set forth in claim 14 wherein the acceptable tolerances include curve elevation tolerances and maximum allowable runoff tolerances.

18. A method for analyzing a track on which a vehicle is traveling, comprising:

a) determining track parameters comprising at least one parameter of a group including a grade of the track, a superelevation of the track, a gauge of the track, and a curvature of the track;

b) determining in real-time if the track parameters are within acceptable tolerances; and

c) if any one of the track parameters are not within acceptable tolerances, generating corrective measures.

19. The method set forth in claim 18, before step b) further including:

d) determining a plurality of calculated parameters as a function of the track parameters;

step b) further including:

e) determining in real-time of if the calculated parameters are within acceptable tolerances; and

step c) further including:

f) if any one of the calculated parameters are not within acceptable tolerances, generating corrective measures.

20. The method set forth in claim 19 wherein the corrective measures are generated in real-time.

21. The method set forth in claim 18, before step b) further including:

d) determining a temperature associated with the track detector determining the track parameters in step a);

e) adjusting the track parameters to compensate for track detector temperature drift.

22. The method set forth in claim 18, before step b) further including:

d) determining a set of orthogonal accelerations experienced by the vehicle;

e) determining if the orthogonal accelerations are within acceptable tolerances; and

f) if any one orthogonal acceleration is not within acceptable tolerances, adjusting the track parameters to compensate for each orthogonal acceleration that is not within acceptable tolerances.

23. The method set forth in claim 18, further including:

d) displaying the corrective measures on a video display device.

24. The method set forth in claim 18, further including:

d) communicating the corrective measures to a locomotive control computer associated with the vehicle.

25. The method set forth in claim 24, further including:

e) communicating the corrective measures to at least one of a truck lubrication system and a truck steering mechanism.

26. The method set forth in claim 18, further including:

d) accessing the acceptable tolerances from a look-up table.

27. The method set forth in claim 26 wherein the acceptable tolerances identify urgent defects and priority defects, further including:

e) identifying the corrective measures as actions to be implemented substantially immediately for urgent defects; and

f) identifying the corrective measures as actions to be implemented within a predetermined response window for priority defects.

28. The method set forth in claim 26 wherein the step of accessing the acceptable tolerances include:

e) accessing acceptable curve elevation tolerances and acceptable maximum allowable runoff tolerances.

29. A track/vehicle analyzer included on a vehicle traveling on a track, the track/vehicle analyzer comprising:

a track detector for determining track parameters comprising at least one parameter of a group including a grade of the track, a superelevation of the track, a gauge of the track, and a curvature of the track;

a vehicle detector for determining vehicle parameters comprising at least one parameter of a group including a speed of the vehicle relative to the track, a distance the vehicle has traveled on the track, forces on a drawbar of the vehicle, a set of global positioning system coordinates for the vehicle, and a set of orthogonal accelerations experienced by the vehicle; and

a computing device, communicating with the track detector and the vehicle detector, for determining in real-time if the track parameters and the vehicle parameters are within acceptable tolerances and, if any one of the track parameters or the vehicle parameters are not within acceptable tolerances, generating corrective measures.

30. The track/vehicle analyzer set forth in claim 29, the track detector further comprising:

a vertical gyroscope for determining the grade of the track and the superelevation of the track;

a gauge determiner for determining the gauge of the track; and

a rate gyroscope for determining the curvature of the track.

31. The track/vehicle analyzer set forth in claim 30, the vertical gyroscope comprising a vertical gyroscope selected from the group including a mechanical vertical gyroscope and a solid state vertical gyroscope.

32. The track/vehicle analyzer set forth in claim 30, the rate gyroscope comprising a rate gyroscope selected from the group including a mechanical rate gyroscope and a solid state rate gyroscope.

33. The track/vehicle analyzer set forth in claim 29, the vehicle detector further comprising:

a speed determiner for determining the speed of the vehicle relative to the track;

a distance determiner for determining the distance the vehicle has traveled on the track;

a force determiner for determining the forces on the drawbar of the vehicle;

a global positioning determiner for determining the set of global positioning system coordinates for the vehicle; and

an accelerometer assembly for determining the set of orthogonal accelerations experienced by the vehicle.

34. The track/vehicle analyzer set forth in claim 33, the speed determiner including:

a toothed gear having teeth passing a sensor for inducing a voltage in a coil, a frequency of the voltage being proportional to a speed of the vehicle relative to the track.

35. The track/vehicle analyzer set forth in claim 33, the speed determiner including:

a light source;

a light detector for generating a signal with a voltage proportional to an amount of light detected; and

a circular plate operationally coupled to a wheel of the vehicle and disposed between the light source and the light detector so that the plate blocks light from the detector, the plate having a plurality of slots positioned so that each slot permits light from the light source to be detected by the light detector when the plate is rotated so that the slot is aligned between the light source and the light detector, a frequency of the signal from the light detector being proportional to a speed of the vehicle relative to the track.

36. The track/vehicle analyzer set forth in claim 29 wherein the computing device determines a plurality of calculated parameters as a function of the

track parameters and the vehicle parameters, determines in real-time if the calculated parameters are within acceptable tolerances, and, if any one of the calculated parameters are within acceptable tolerances, generates corrective measures.

37. The track/vehicle analyzer set forth in claim 36 wherein the computing device generates corrective measures in real-time.

38. The track/vehicle analyzer set forth in claim 29, further comprising:

a temperature determiner for determining a temperature associated with the track detector and the vehicle detector.

39. The track/vehicle analyzer set forth in claim 29, further including:

a video display device communicating with the computing device, the corrective measures including messages displayed on the video display device for use by the vehicle operator.

40. The track/vehicle analyzer set forth in claim 29, further including:

a communications device in communication with the computing device for communicating the corrective measures and associated track parameters and vehicle parameters to a locomotive control computer associated with the vehicle.

41. The track/vehicle analyzer set forth in claim 40 wherein the communications device is also for communicating with an upcoming track feature including a feature selected from a group including a track switch and a track crossing to determine the condition of the feature.

42. The track/vehicle analyzer set forth in claim 40 wherein the communications device also communicates the corrective measures to at least one of a truck lubrication system and a truck steering mechanism.

43. A method of analyzing a vehicle and a track on which the vehicle is traveling, comprising:

a) determining track parameters comprising at least one parameter of a group including a grade of the track, a superelevation of the track, a gauge of the track, and a curvature of the track;

b) determining vehicle parameters comprising at least one parameter of a group including a speed of the vehicle relative to the track, a distance the vehicle has traveled on the track, forces on a drawbar of the vehicle, a set of global positioning system coordinates for the vehicle, and a set of orthogonal accelerations experienced by the vehicle;

c) determining in real-time if the track parameters and the vehicle parameters are within acceptable tolerances; and

d) if any one of the track parameters or the vehicle parameters are not within acceptable tolerances, generating corrective measures.

44. The method set forth in claim 43, step a) further including:

e) communicating with an upcoming track feature including a feature selected from a group including a track switch and a track crossing to determine the condition of the feature.

45. The method set forth in claim 43, step b) further including:

e) producing light from a first source;

f) passing the light through a plurality of slots in a first plate which rotates as a function of the distance the vehicle travels relative to the track, a spacing between the slots being known;

g) producing first electrical pulses when light from the first source passes through the slots and is received by a first detector; and

h) determining the distance the vehicle has traveled on the track as a function of a number of the first pulses received by the first detector.

46. The method as set forth in claim 45, step b) further including:

i) determining the speed of the vehicle relative to the track as a function of a frequency of the first pulses.

47. The method as set forth in claim 45, step b) further including:

i) producing light from a second source;

j) passing the light from the first and second sources through a plurality of slots in a the first plate and a second plate, respectively, which rotate as a function of the distance the vehicle travels relative to the track, the slots in the first plate being offset a predetermined amount from the slots in the second plate;

k) producing second electrical pulses when light from the second source passes through the slots and is received by a second detector; and

l) determining a direction the vehicle is traveling on the track as a function of the first and second electrical pulses.

48. The method set forth in claim 43, before step c) further including:

e) determining a plurality of calculated parameters as a function of the track parameters and the vehicle parameters;

step c) further including:

f) determining in real-time of if the calculated parameters are within acceptable tolerances; and

step d) further including:

f) if any one of the calculated parameters are not within acceptable tolerances, generating corrective measures.

49. The method set forth in claim 48 wherein the corrective measures are generated in real-time.

50. The method set forth in claim 43, before step c) further including:

e) determining a temperature associated with the track detector determining the track parameters in step a) and the vehicle detector determining the vehicle parameters in step b);

f), adjusting the track parameters and the vehicle parameters to compensate for track detector temperature drift and vehicle detector temperature drift.

51. The method set forth in claim 43, further including:

e) displaying the corrective measures on a video display device.

52. The method set forth in claim 43, further including:

e) communicating the corrective measures to a locomotive control computer associated with the vehicle.

53. The method set forth in claim 43, further including:

e) communicating the corrective measures to at least one of a truck lubrication system associated with the vehicle and a truck steering mechanism associated with the vehicle.

54. A track/vehicle analyzer included on a vehicle traveling on a track, the track/vehicle analyzer comprising:

a track detector for determining track parameters comprising at least one parameter of a group including a grade of the track, a superelevation of the track, a gauge of the track, and a curvature of the track;

a vehicle detector for determining vehicle parameters comprising at least one parameter of a group including a speed of the vehicle relative to the track, a distance the vehicle has traveled on the track, forces on a drawbar of the vehicle, a set of global positioning system coordinates for the vehicle, and a set of orthogonal accelerations experienced by the vehicle;

a computing device, communicating with the track detector and vehicle detector, for a) determining a plurality of calculated parameters as a function of the track parameters and the vehicle parameters, b) determining in real-time if the track parameters, the vehicle parameters, and the calculated parameters are within acceptable tolerances, and c) if any one of the track parameters, the vehicle parameters, or the calculated parameters are not within acceptable tolerances, generating corrective measures; and

a communications device in communication with the computing device for communicating the corrective measures to at least one of a truck lubrication system and a truck steering mechanism in at least one of the vehicle, a locomotive associated with the vehicle, or a railroad car associated with the vehicle.

55. The track/vehicle analyzer set forth in claim 54 wherein the calculated parameters include a balance speed parameter for the vehicle and the computing device is also for determining in real-time if the track parameters, the vehicle parameters, and the calculated parameters associated with the balance speed parameter are within acceptable tolerances associated with the calculated balance speed parameter, and c) if any one of the track parameters, the vehicle parameters, or the calculated parameters associated with the balance speed parameter are not within acceptable tolerances associated with the balance speed parameter, determining a first optimized lubrication strategy for the truck lubrication system.

56. The track/vehicle analyzer set forth in claim 55 wherein the communications device is also for communicating the first optimized lubrication strategy to the truck lubrication system to promote operational safety and overall efficiency, including fuel efficiency, minimizing vehicle wheel wear, and minimizing track wear.

57. The track/vehicle analyzer set forth in claim 54 wherein the calculated parameters include a balance speed parameter for the vehicle and the computing device is also for determining in real-time if the track parameters, the vehicle parameters, and the calculated parameters associated with the balance speed parameter are within acceptable tolerances associated with the calculated balance speed parameter, and c) if any one of the track parameters, the vehicle parameters, or the calculated parameters associated with the balance speed parameter are not within acceptable tolerances associated with the balance speed parameter, determining a first optimized steering strategy for the truck steering mechanism.

58. The track/vehicle analyzer set forth in claim 57 wherein the communications device is also for communicating the first optimized steering strategy to the truck steering mechanism to promote operational safety and overall efficiency, including fuel efficiency, minimizing vehicle wheel wear, and minimizing track wear.

59. A method for improving operational safety and overall efficiency, including fuel efficiency, vehicle wheel wear, and track wear, for a track and a vehicle traveling on the track, comprising:

a) determining track parameters comprising at least one parameter of a group including a grade of the track, a superelevation of the track, a gauge of the track, and a curvature of the track;

b) determining vehicle parameters comprising at least one parameter of a group including a speed of the vehicle relative to the track, a distance the vehicle has traveled on the track, forces on a drawbar of the vehicle, a set of global positioning system coordinates for the vehicle, and a set of orthogonal accelerations experienced by the vehicle;

c) determining a plurality of calculated parameters as a function of the track parameters and the vehicle parameters, including a balance speed parameter for the vehicle;

d) determining in real-time if the track parameters, the vehicle parameters, and the calculated parameters associated with the balance speed parameter are within acceptable tolerances associated with the balance speed parameter;

e) if any one of the track parameters, the vehicle parameters, or the calculated parameters associated with the balance speed parameter are not within acceptable tolerances, determining a first optimized lubrication strategy for the vehicle; and

f) communicating the first optimized lubrication strategy to at least one truck lubrication system in the vehicle to promote operational safety and overall efficiency, including fuel efficiency, minimizing vehicle wheel wear, and minimizing track wear.

60. A method for improving operational safety and overall efficiency, including fuel efficiency, vehicle wheel wear, and track wear, for a track and a vehicle traveling on the track, comprising:

a) determining track parameters comprising at least one parameter of a group including a grade of the track, a superelevation of the track, a gauge of the track, and a curvature of the track;

b) determining vehicle parameters comprising at least one parameter of a group including a speed of the vehicle relative to the track, a distance the vehicle has traveled on the track, forces on a drawbar of the vehicle, a set of global positioning system coordinates for the vehicle, and a set of orthogonal accelerations experienced by the vehicle;

c) determining a plurality of calculated parameters as a function of the track parameters and the vehicle parameters, including a balance speed parameter for the vehicle;

d) determining in real-time if the track parameters, the vehicle parameters, and the calculated parameters associated with the balance speed parameter are within acceptable tolerances associated with the balance speed parameter;

e) if any one of the track parameters, the vehicle parameters, or the calculated parameters associated with the balance speed parameter are not within acceptable tolerances, determining a first optimized steering strategy for the vehicle; and

f) communicating the first optimized steering strategy to at least one truck steering mechanism in the vehicle to promote operational safety and overall efficiency, including fuel efficiency, minimizing vehicle wheel wear, and minimizing track wear.

61. A method for improving operational safety and overall efficiency, including fuel efficiency, vehicle wheel wear, and track wear, for a track and a train traveling on the track, comprising:

a) determining track parameters comprising at least one parameter of a group including a grade of the track, a superelevation of the track, a gauge of the track, and a curvature of the track;

b) determining train parameters associated with a vehicle of the train including forces on a drawbar of the vehicle;

c) determining a plurality of calculated parameters as a function of the track parameters and the train parameters;

d) determining in real-time if the track parameters, the train parameters, and the calculated parameters are within acceptable tolerances;

e) if any one of the track parameters, the train parameters, or the calculated parameters are not within acceptable tolerances, generating corrective measures; and

f) communicating the corrective measures to at least one of a truck lubrication system and a truck steering mechanism in at least one vehicle associated with the train to promote operational safety and overall efficiency, including fuel efficiency, minimizing vehicle wheel wear, and minimizing track wear.